Nursing Minimum Data Set Based on EHR Archetypes Approach

Dandara N. Spigolon, RN, MA[1], Cláudia M.C. Moro, Eng, PhD[1]
[1]Health Technology Postgraduate Program – Pontifical Catholic University of Parana, Brazil

Abstract

The establishment of a Nursing Minimum Data Set (NMDS) can facilitate the use of health information systems. The adoption of these sets and represent them based on archetypes are a way of developing and support health systems. The objective of this paper is to describe the definition of a minimum data set for nursing in endometriosis represent with archetypes. The study was divided into two steps: Defining the Nursing Minimum Data Set to endometriosis, and Development archetypes related to the NMDS. The nursing data set to endometriosis was represented in the form of archetype, using the whole perception of the evaluation item, organs and senses. This form of representation is an important tool for semantic interoperability and knowledge representation for health information systems.

Introduction

The Nursing Minimum Data Set (NMDS) was elaborated with essential elements that describe clinical nursing practice[1,2]. It was defined to support information collection in the course of providing nursing care, including different contexts. This set evolved to i-NMDS[3] (International Nursing Minimum Data Set) that refers to a framework for collecting information to describe and examine nursing practice, nursing resources and selected healthcare problems[2,3]. It offers data to help decisions, information exchange and nursing information systems application, as Electronic Health Record (EHR).

But only using NMDS is not guarantee of a good health information system, it is also necessary to consider the interoperability between different systems, including semantic representation. EHR Archetypes are a formal and a consensus standard interoperable specification of best practice representation of clinical data structure[4,5,6]. They can be added to EHR systems, allowing the path to standards-based interoperability[7]. The standardization of data is fundamental to achieve semantic interoperability in any domain. This means that the information provided will be used properly by the computer system that receives. It is essential in health area, where is very important to exchange critical data between institutions and professionals[5]. The archetype model was proposed by the OpenEHR Foundation (www.openEHR.org) and has been considered effective for the definition of flexible, semantically interoperable medical records.

Archetypes are clinical knowledge concepts in a structured way. They support the recording required for common clinical activities as observations, evaluations, instructions and actions. Data are stored in an EHR in structures named 'Composition', e.g. surgery descriptions or discharge summaries[8]. Archetypes can be simple, such as temperature, blood pressure or diagnosis, or complex, such as analyzing cardiac risk. The archetypes contain a maximum data set about each clinical concept, as: protocol, or method of measurement; related events; and context that is required for the clinical data to be interpreted accurately. 'Templates' are aggregations of archetypes created in order to capture the data-set corresponding to a particular clinical task, such as an ICU discharge summary.

Archetype Definition Language (ADL) is a formal language for expressing archetypes, and can be categorized as a knowledge description language. It provides a formal, abstract syntax for describing constraints on any domain entity whose data is described by an information model, as Unified Model Language (UML), XML, HTML and mindmaps. There are some archetype editors that enable its adoption. LinkEHR-ED (http://www.linkehr.com/) is an example of these editors. .

Considering that is necessary to include NMDS in health information systems and archetypes are one of the main standards to represent EHR, it is essential to facilitate integration of these data sets applying archetypes. The goal of this work is to describe NMDS represented based on archetype standard proposed by openEHR Foundation. NMDS representations applying archetypes can make easer the development and adoption of an EHR.

Method

A NMDS for endometriosis attendance was developed based on archetypes structure model. It was elaborated in two steps:

1. Definition of the data set a core for nursing care to patients with endometriosis.
2. Construction and representation of archetypes based on the data set formed.

The first step was the definition of the essential data set for nursing care for patient with endometriosis, established based on theoretical analytical and on two categories of the i-NMDS[3]: patient demographics and data on nursing care, related to endometriosis specific information on. The data category of nursing care is covered under the Basic Human Needs[9] and the Nursing Process[10] containing the History and Physical Examination of Nursing; Nursing Diagnosis; Planning; Implementation and Evaluation and Results, and complemented by other references. After the elaboration of the set, it was analyzed by six physicians and two nurse specialist in endometriosis who indicated which are the essential and important data to the set be formed. All these professionals work with patients suffering from endometriosis and also have publication in this clinical area.

The second stage was developed from the data set specification, which was the basis for archetype construction. We chose a set of items for its construction through the category "Cluster", elaborating a set of elements related to the information definition, ontologies and clinical data that should be observed during patient care. They are represented by the specified tree and applying ADL, using the LinkEHR archetypes editor.

Results

The NMDS for patients with endometriosis is formed with 51 elements. The complete set is available at:

https://docs.google.com/viewer?a=v&pid=explorer&chrome=true&srcid=0B6nvE_wCmxYcNDYxZmMxZGUtZGVhZC00MDdhLWFmNDQtNmMxZTRlOWVmYjQw&hl=pt_BR

A archetype model constructed representing the item "Perception of Organs and Senses", with their respective elements that are related to "pain" and "Signs and Symptoms". These are some of the elements from de NMDS propoudes. Those data are extremely important during women with endometriosis care, as they are related to unpleasant situations and common problems to these women's lives, as: dysmenorrhea (painful menstruation); dyspareunia (pain during intercourse); dysuria (pain urination); local of the pain; pain intensity; among other problems that refers the sense of "PAIN" and "SIGNS AND SYMPTOMS." The archetypes are represented as shown in Figure 1 and the tree structure of the archetype (Archetype Tree) in Figure 2.

The data of this example were translated to English to facilitate the paper reading, but it was structured in Portuguese, as the NMDS. Although, is important to emphasize that one archetype support several languages. So it is not necessary to translate the data sets, only the archetype definition.

Discussion

The methodology used to modeling EHR systems and the need for semantic interoperability between different information systems had been topics of relevance in the international scientific community of health informatics. The archetypes are a way of developing and support interoperability between systems, defined as the standard for the integration of EHR. Leading to the importance of specifying minimum data sets and representing them using archetypes. The trend is that data set definition contains the same integration needs to a information systems, as a recognized standard and use the vocabulary and terminology used in the clinical practice of nursing care.

The definition of MDS related to clinical areas that information need and care process are not completely known, can support and improve clinical care. This is the situation of endometriosis, especially in Brazil. As there are few professionals, almost any nurses, working with patients suffering from this pathology, the NMS proposed can encourage them. This is the first version of the set, after professional adopt it, probably they will make suggestions. It is a beginning, it is necessary to have a point of start. Furthermore the number of specialists may be limited, but the participants of this research represent endometriosis research area in Brazil. The new users of the set, can contribute to it evaluation and improvement.

Considering that archetypes are detailed clinical models expressed as a set of clinical concepts, they classify and organize the classes in a reference model, expressing ideas clinical conditions (eg, blood pressure, heart rate, pain). They also have a great advantage in the form of knowledge representation, which can be used as needed and appropriate in any health information. They are designed to facilitate the implementation and data quality, and to achieve interoperability. Two information systems only need to know about information related to the archetype that they wish to share in order to interoperate. Also, it is very simple to transform archetypes into classes/objects to EHR systems. So, the NMDS proposed can be easily included into an EHR system used during endometriosis patient care.

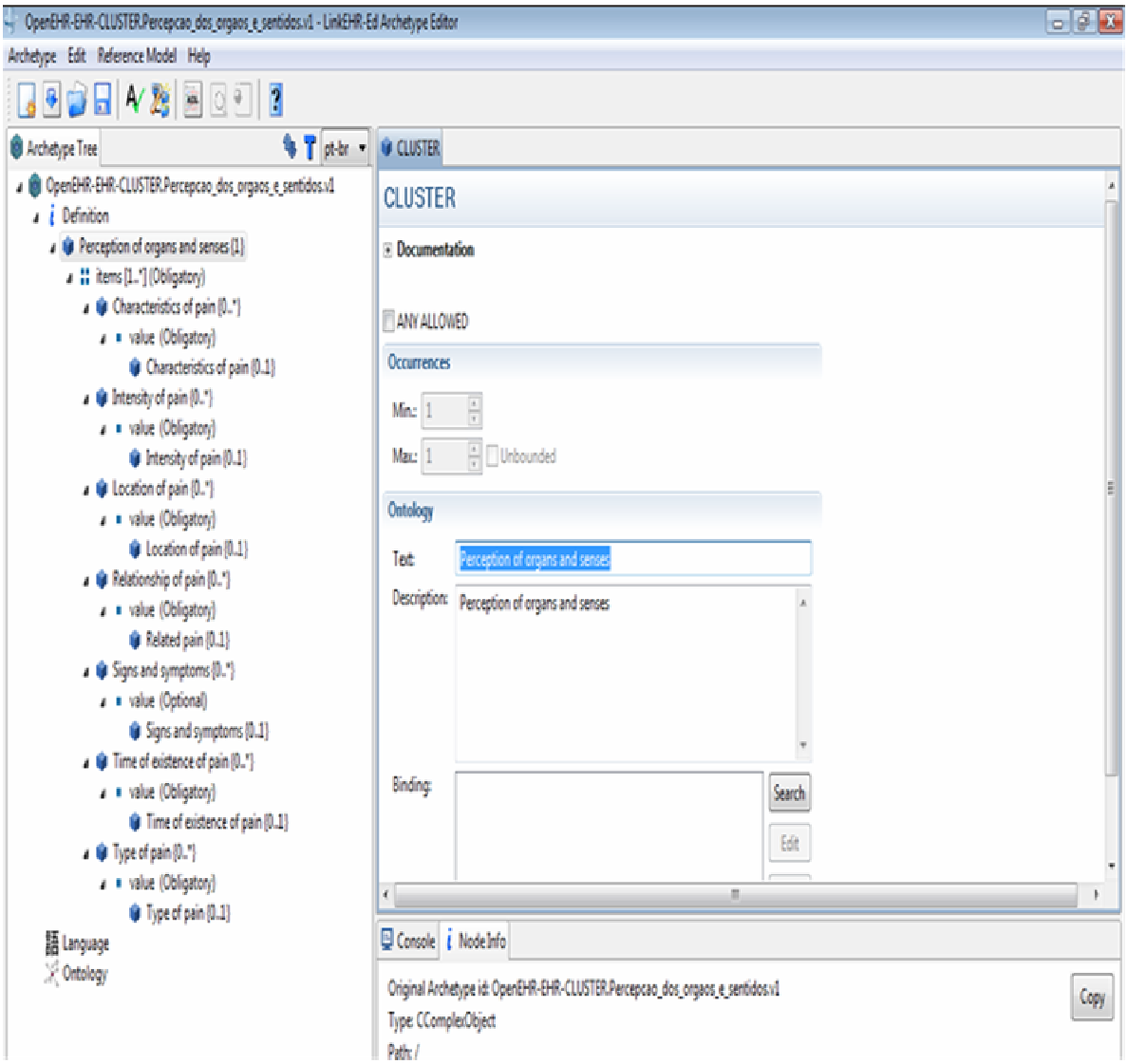

Figure 1. "Perception of Organs and Senses" Arqchetype.

Furthermore, the clinical information can be created and modified at any time without affecting the software object model or database structure. Also allows the definition of a common knowledge shared by all actors involved in the process of care, and access to data can be controlled using a knowledge base for automatic processing, such as decision support systems. The important thing is to enable communication of part or all patient electronic health record, preserving the original clinical significance.

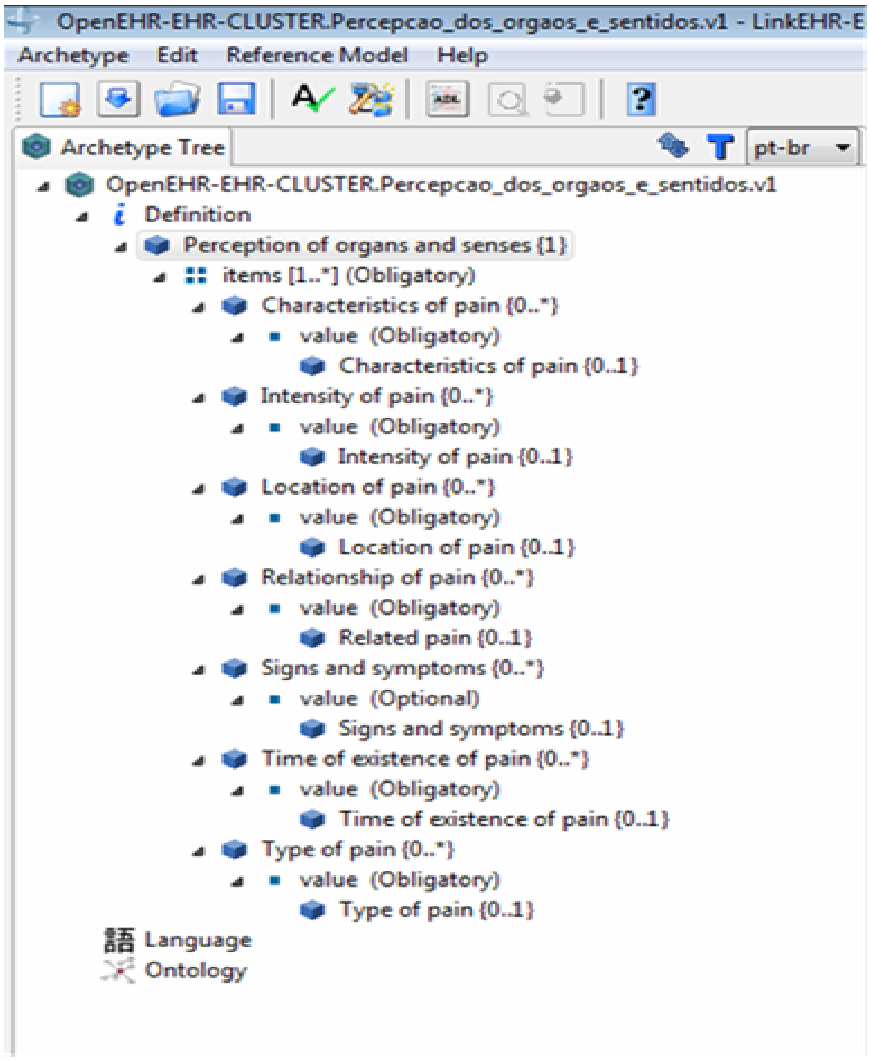

Figure 2. Archetype tree.

Conclusion

This study adhered to modeling information using a minimum data set of nursing knowledge to express and define standards for specific characteristics of the clinical data, in this case, nursing care in endometriosis.

Success was achieved in the construction of the NMDS and in the way as the information was represented. Allowing a clear, structured and organized specification of the information essential to nursing care of patients with endometriosis and supporting its utilization in a nursing information system.

Nowadays, the experience of using archetypes approach in EHR systems is growing, with positive trends in the interoperability of electronic health records in the future, being a promising approach to create a shareable systems.

References

1. Werley HH, Devine EC, Zorn CR, Ryan P, Westra BL. The Nursing Minimum Data Set: abstraction tool for standardized, comparable, essential data. Am J Public Health. 1991 Apr;81(4):421-6.

2. Hobbs J. Political dreams, practical boundaries: the case of the Nursing Minimum Data Set, 1983-1990. Nurs Hist Rev. 2011;19:127-55.
3. United States of American. Center for Nursing Minimum Data Set knowledge Discovery. i- NMDS: International Nursing Minimum Data Set, 2010. The University of Minnesota. School of Nursing. 2010. <http://www.nursing.umn.edu/ICNP/i-NMDS/index.htm>.
4. Maldonado JA. et al. Framework for clinical data standardization base on archetypes. Studies in Health Technology and Informatics. 2007; 129: 454-458.
5. Wollersheim D, Sari A, Rahayu W. Archetype-based electronic health records: a literature review and evaluation of their applicability to health data interoperability and access. HIM J. 2009;38(2):7-17.
6. Martinez-Costa, C., M. Menarguez-Tortosa & J. T. Fernandez-Breis. An approach for the semantic interoperability of ISO-EN 13606 and OpenEHR archetypes. Journal of Biomedical Informatics. 2010; 43; 736-746.
7. Chen R, Klein G, Sundvall E, Karlsson D, Åhlfeldt H.BMC Archetype-based conversion of EHR content models: pilot experience with a regional EHR system. Med Inform Decis Mak. 2009; 9: 33.
8. ISO 13606-3:2009. Health informatics Electronic health record communication Part 3: Reference archetypes and term lists. 2008. <http://www.iso.org/iso/iso_catalogue/catalogue_tc/catalogue_detail.htm?csnumber=50119>.
9. Horta WA. Processo de Enfermagem. São Paulo. EPU/Edusp, 1979.
10. Brasil. Conselho Federal de Enfermagem. Resolução Cofen nº 358/2009. Brasília (DF), p. 1-4, 2009. <http://www.portalcofen.gov.br/sitenovo/node/4384>.

.